

Waste Water at Yorkley Court Community Farm

It is proposed that YCCF build a soak-away system to treat waste water from domestic use on site. The following is a summary of the methodology carried out.

Generation of Waste Water

In order to calculate the sizing for a soak-away system waste water figures must first be calculated. The following water figures are taken from "Water Efficiency Best Practice Manual" prepared for the National Trust by local company Elemental Solutions in 2000:

Household Size (persons)	High Usage (litres per person per day)	Average Usage (litres per person per day)	Low usage (litres per person per day)
1	219	164	110
2	205	151	96
3	192	134	91
4	171	123	89
5	153	110	82
6	137	94	71

At YCCF the water use is likely to be very low due to the lifestyle and degree of communal activity, but a conservative estimate can be used by taking the average figure for a household of six – 94 litres per person equivalent.

A breakdown of how 94 litres is proportioned between the different appliances in the standard domestic arrangement can be guided by Anglian Water's figures shown in the pie chart here.

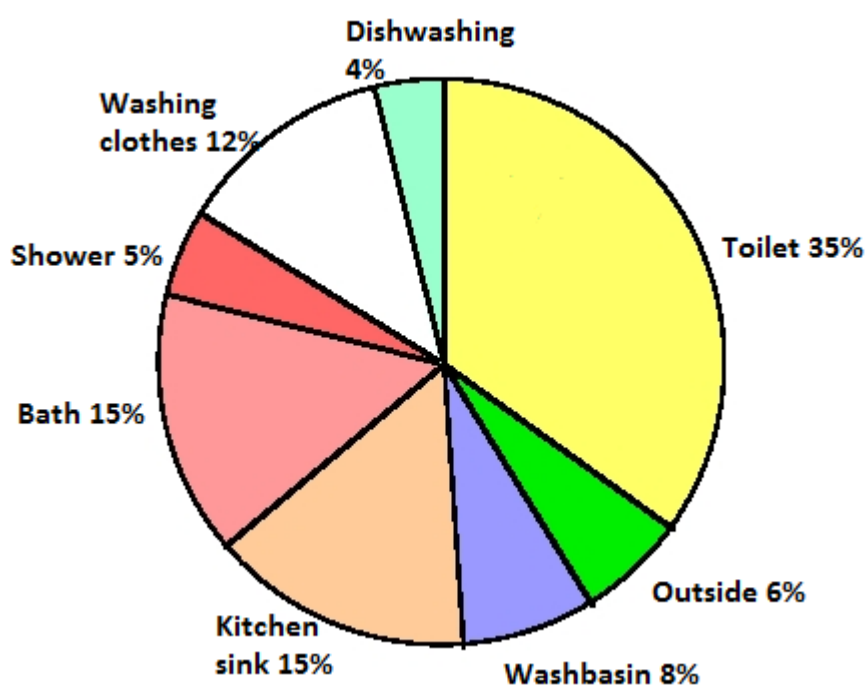


Fig 1: Average consumption 1994 Anglian Water SODCON

However, at YCCF there are important differences from the standard domestic set-up. Most notably, composting toilets are used instead of water toilets and showers are taken instead of baths.

The following table shows the breakdown of water estimates for YCCF. It makes the following assumptions; that a dishwasher uses approximately the same amount of water as washing dishes by hand, that everyone washes their clothes on this day (except guests), that everyone showers on this day and that outside use is not relevant (as this water will not go into the greywater system). It also uses a maximum estimate of guests, 15.

Appliances	Outside	WC	Basin	Sink	Bath	Shower	Clothes Wash	Dishwashing	Total
% of Total	6	35	8	15	15	5	12	4	100
Exists?	N	N	Y	Y	N	Y	Y,N	Y	
Volume (L)	5.6	32.9	7.2	14.1	14.1	4.7	11.3	3.8	94
15 Residents (L)	0	0	108	211.5	0	70.5	169	57	616
15 Guests (L)	0	0	108	211.5	0	70.5	0	57	447
Total (L)	0	0	216	423	0	141	169	114	1063

So it can be seen therefore that the maximum possible waste water generated is 1063L per day. This volume needs then to be converted to Person Equivalent (PE) for the figures for the soakaway area. To do this one divides the volume to be generated (1063 litres) by the volume that an average UK person generates (164 litres) and this suggests that the generated grey water is equivalent to that generated by $1063/164 = 6.5$ PE.

Treatment and Disposal

The simplest and most robust way of treating and disposing of the water is via a leachfield or soak-away. In order to make one that is the right size for the site it is important to take into account the porosity of the soil. BS6297 suggests the use of a Percolation Test. The following procedures will give us the characteristic porosity or percolation value at the site.

The following is a methodology used:

Avoid carrying out this test in extreme weather conditions such as drought, frost and heavy rain.

- 1) Excavate at least two holes 300mm square to a depth 300mm below the proposed invert level (bottom of pipe) of the infiltration pipe and space them evenly along the proposed line of the subsurface irrigation system.
- 2) Fill each hole with water to a depth of at least 300mm and allow to seep away overnight.
- 3) Next day, refill each hole with water to a depth of at least 300mm and observe the time in seconds for the water to seep away from 75% full to 25% full (i.e. a depth of 150mm).
- 4) Divide this time by 150. This answer gives the time in seconds V_p required for the water to drop 1mm.
- 5) The test should be carried out at least three times with at least two trial holes. The average figure from the tests should be taken. This is the percolation value V_p (in seconds).
- 6) The average figure for the percolation dividing by the number of values used.
- 7) Drainage between 15 and 100 and the preliminary assessment of the trial hole is considered favourable
- 8) The minimum value of 15 ensures that untreated effluent cannot percolate too rapidly into ground water.
- 9) Where V_p is above the limit of 100 effective treatment is unlikely to take place in a drainage field as there will be inefficient soakage in this location which may lead to sewage ponding on the surface.

Percolation Test Results

A percolation test was carried out on the area proposed for the system. It should be noted that the day when the experiment was undertaken, rainfall had occurred and the ground was somewhat waterlogged. The test holes were checked every few minutes and the scores below were rounded to 50s.

Test Hole No.	1	2	3	Average
Drainage Time (seconds)	3450	4700	3200	3780
$DT/150 = V_p$	23	31	21	<u>25.1</u>

Size of Soak-away

To calculate the area (A_t) of a soak-away the following equation is used:

$$A_t = PE \times V_p \times 0.25$$

Where;

PE = Number of people served. 6.5 in this case.

V_p = The percolation value. 25.1 in this case.

Therefore:

$$A_t = 6.5 \times 25.1 \times 0.25$$

$$A_t = 40.8$$

So, at least 40 square metres of trenches must be dug.

Construction of a Soak-Away

The soak-away will be a series of 5 descending trenches, approximately 1m width by 0.9m depth and 9m in length, filled with gravel. This gives a total of 45 square metres surface area. This is approximately in line with the calculation of A_t . A pipe from the kitchen and washroom will drain into the first trench and the water will seep downwards. This is shown in the diagram below.

As the area is on a slope, rainwater flows into the soakaway area. This can be avoided by constructing a swale around the top of the soakaway which diverts the water away.

In the spring, willow can be planted on the banks to improve the drainage capabilities.



Figure 1: Trenches being dug

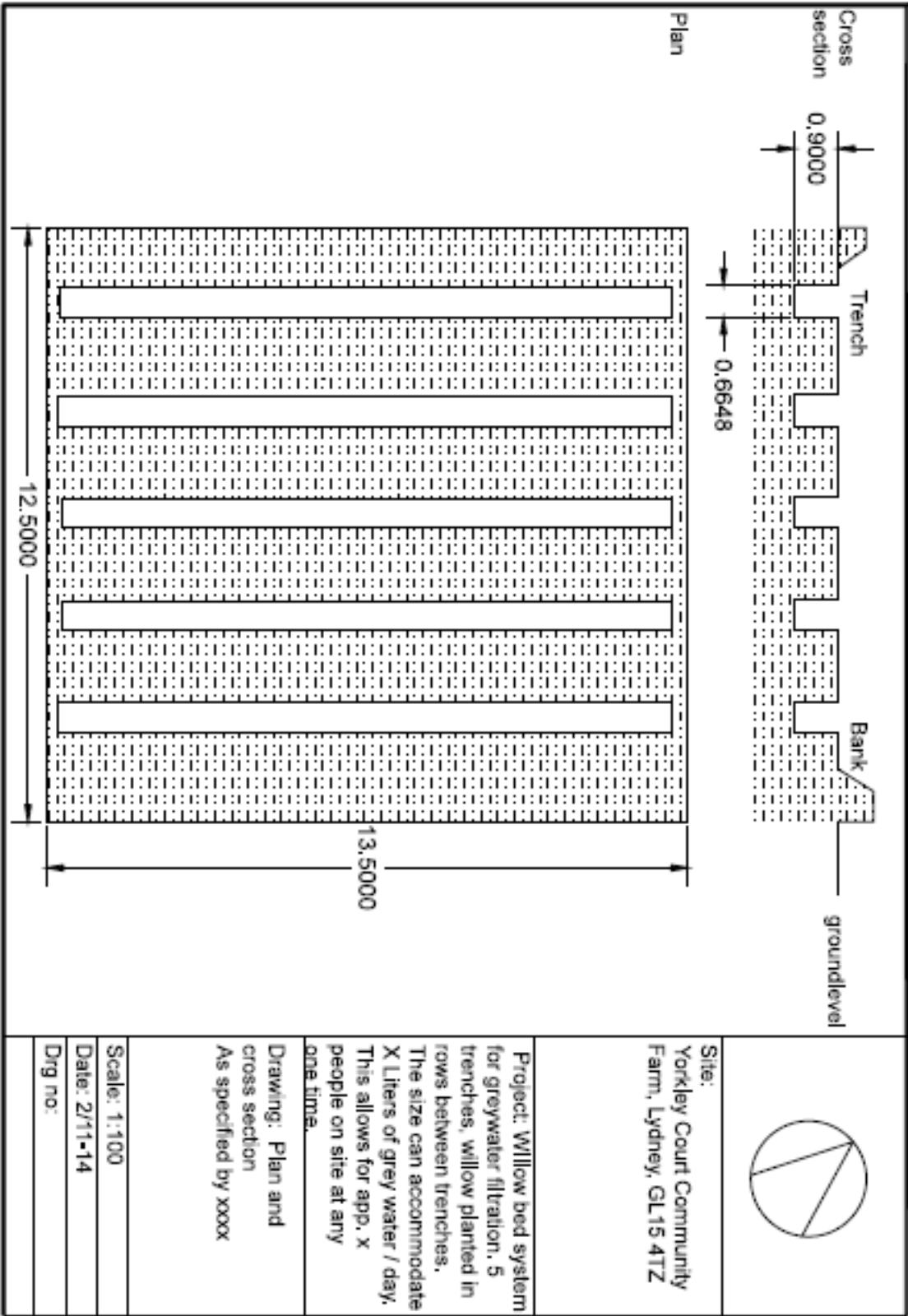


Figure 2: Greywater System Diagram

Conclusion

The proposed works are already underway and will be completed subject to planning approval. As a reserve for the future, there is more space surrounding the soak-away area so that expansion is possible if real world experience shows that the current system is not suffice

